FIFA WORLD CUP Brasil

Ruckus Simply Better Wireless.

case study

Sporting Venues:
World Cup, Brazil

OVERVIEW

The World Cup is the most popular sporting event in the world. In an effort to better prepare for this event and provide an even more compelling user experience, four stadiums were equipped with Ruckus Smart Wi-Fi networks. These were the following:

1. Maracana Stadium, Rio de Janeiro (76,000)
2. Estádio Nacional, Brasília-DF (71,000)
3. Arena Fonte Nova, Salvador (50,400)
4. Arena Pantanal, Cuaibá (43,600)

WHAT THEY NEEDED

- Reliable high-speed wireless data service in very high-density venues.
- Offload the 3G and 4G DAS networks
- Multi-megabit per second speeds from any public location in the venues to thousands of fans simultaneously.

WHAT WAS DEPLOYED

The four stadiums deployed a combination of Ruckus Zoneflex APs, WLAN Controllers, and the SmartCell Insight for detailed reporting.

WHAT THEY ACHIEVED

Performance numbers were consistently in the multi-megabit or tens of multi-megabit per second range in the venue during actual World Cup matches.

THE CHALLENGE WITH SPORTING VENUES

Stadiums and arenas are amongst the most difficult locations imaginable to deploy Wi-Fi networks because of the requirement for both very high performance and very high density. The Maracana Stadium in Rio can seat 76,000 fans in a fairly confined space. Providing high-speed wireless services in such an environment requires carrier class equipment along with deployment expertise. These types of venues have traditionally utilized distributed antenna systems (DAS) to provide cellular connectivity, which is an excellent neutral host solution for voice but can quickly be overloaded by data traffic—especially in today's data-centric world where almost every football fan has an iPhone or Android smartphone and is constantly uploading videos or photos to Facebook. After all, part of going to the World Cup is to make sure your friends back home get to see lots of pictures and videos of you in the stadium. To deal with this major change in fan behavior, it was necessary to add a great deal more data capacity and there is no better way to do this then with Wi-Fi. For the World Cup, a consortium of four mobile operators in Brazil came together to install these Wi-Fi networks to offload their DAS networks and to greatly enhance the user experience.

Figure 1: The 76,000 seat Maracana Stadium in Rio hosted the World Cup Finals Match with 217 Ruckus Wi-Fi APs

A big part of the challenge for any venue is to get a sense for how much capacity is required to meet the expected demand. The trends of late point to a need to support up to 35% of fans wanting to go online (with 15% simultaneous usage at peak, and that number will undoubtedly go up in the years to come) and to plan for 300 kbps per fan. This points to a need in large stadiums for well over 1 Gbps of data network capacity, and that's only the

Sporting Venues
World Cup, Brazil

beginning. In the next few years these performance numbers will approach 2 or 3 Gbps in the larger venues. This is something that just can't be supported with today's DAS systems. The trend more and more is DAS for voice and Wi-Fi for data. Another interesting trend we've seen is that uplink requirements can often be higher than downlink requirements. This certainly wasn't the norm in the pre-Facebook, iCloud and Dropbox era, but now you see a lot of uploads occurring in stadiums. This will directly impact the network design and the choice of equipment.

The design of these networks will vary greatly depending on the nature of the venue. Every structure is different and different approaches are needed for success. Vertical assets make for some of the best mounting locations (see figure 2). Here we see the Arena Fonte Nova in Brazil where AP's were mounted on cables that were deployed as part of the roof design. These AP's can then direct an RF signal down into the seating areas below. Other venues may not have vertical assets, in which case other approaches are required.

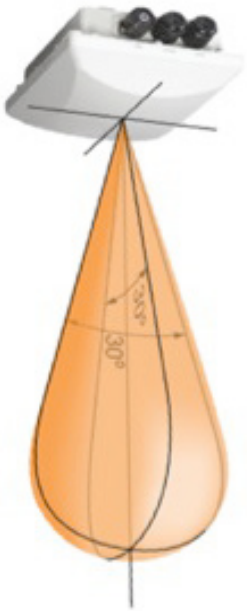
One of the many challenges with a stadium design is to make a determination on the number of access points that are required. To support several Gbps of data capacity and thousands of simultaneously connected users, a large number of AP's are required (typically in the hundreds), but more APs isn't always a good thing. The more AP's that are installed, the greater the interference, which is the limiting factor in a high-density deployments.

Before taking a look at network design best practices it is worthwhile to look at the design of the actual APs.
Access points for stadiums require a number of special capabilities:

- It is almost always a good idea to use integrated antennas as it makes mounting easier and it greatly improves esthetics. The latter can play a big role in a successful deployment.
- Narrowbeam antennas are essential when mounting APs overhead. The narrower the beam the more precisely fans can be targeted and the better the performance.
- Interference mitigation support is especially important when mounting APs in close proximity, and everything in a stadium is in close proximity.
- Environmental hardening is required for outdoor use in open bowls
- High performance AP's that can get users on and off the airlink quickly. This really matters in getting truly high performance in high-density applications.
- Strong uplink performance for all those Facebook users.

Figure 2: (Above) Arena Fonte Nova in Brazil with 151 Ruckus Wi-Fi APs during construction

Figure 3: (Below) 30 degree narrow-beam antennas integrated into Ruckus APs are an excellent option for over-head deployments.



Ruckus®
Simply Better Wireless.

Sporting Venues
World Cup, Brazil

Uplink performance is one of the most important capabilities for an AP in stadium deployments as there is so much traffic heading back toward the Internet. The key to uplink performance is receive sensitivity in the AP as the smartphones are always power limited by their use of batteries. It is always best to look for APs with very high receive sensitivity as this gives a compelling user experience.

When designing stadium networks the key is to make use of all possible vertical assets to get the desired coverage across all public seating areas. Stadium networks will typically require 100 to 200 APs for most large venues. With careful design and carrier class access points it is possible to get some truly impressive performance numbers in the most challenging environments imaginable.

One capability that is essential in any stadium deployment is a tool to measure and report on network performance. The Ruckus SmartCell Insight (SCI) platform does a great job of providing statistics on network performance. In figure 5 we see a report on uplink and downlink traffic along with number of connected users.

INTERFERING NETWORKS

To provide a compelling user experience, it is best to limit, to the extent possible, the number of Wi-Fi networks that will be operating in the stadium bowl. These usually involve wireless networks put in by TV broadcasters, but other rogue networks are also possible. These networks will often consist of Wi-Fi equipment that is not carrier class and may not have been properly installed. The result is the potential for interference. This problem is especially severe in the very crowded 2.4 GHz band.

SUMMARY

Ruckus has rapidly emerged as a leader in high-capacity density deployments due in large part to our RF excellence and our deployment experience. A well designed stadium network can deliver some truly impressive results, which will keep your fans happy and keep them coming back for more.

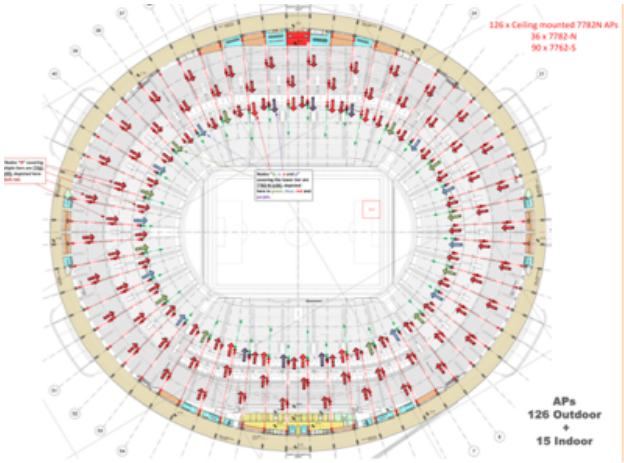


Figure 4: (Above) The Maracana Stadium required 126 access points in the main seating area

Figure 5: (Below) SmartCell Insight Reporting from Maracana Stadium

Ruckus
Simply Better Wireless.

www.ruckuswireless.com

Ruckus Wireless, Inc.
350 West Java Drive
Sunnyvale, CA 94089 USA
(650) 265-4200 Ph \ (408) 738-2065 Fx